

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554**

In the Matter of	)	
	)	
	)	
Amendment of Parts 1, 21, 73, 74 and 101	)	WT Docket No. 03-66
of the Commission's Rules to Facilitate the	)	RM-11614
Provision of Fixed and Mobile Broadband	)	
Access, Educational and Other Advanced	)	
Services in the 2150-2162 and 2500-2690	)	
MHz Bands	)	
	)	

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**COMMENTS**

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The Wireless Communications Association International, Inc. (“WCAI”), the trade association of the wireless broadband industry, submits these comments in support of the changes to Section 27.53(m) of the Commission’s rules proposed in the Fourth Further Notice of Proposed Rulemaking (“NPRM”) in this proceeding.<sup>1</sup>

## **I. Discussion**

In its Petition for Rulemaking (“PFR”),<sup>2</sup> WCAI asked that the Commission amend the out-of-band-emission (“OOBE”) limits for mobile digital stations in the 2.5 GHz band to accommodate the use of the wider channel bandwidths. Specifically, WCAI asked that the Commission relax slightly the OOBE limits for mobile digital stations in section 27.53(m)(4) from  $43 + 10 \log (P)$  dB to  $40 + 10 \log (P)$  dB at the channel edges, and impose a  $43 + 10 \log (P)$  dB attenuation factor beyond 5 MHz from the channel edges, and a  $55 + 10 \log (P)$  dB attenuation factor at “X” MHz from the channel edges where “X” is the greater of 6 MHz and the actual channel bandwidth. WCAI also requested that the Commission allow a resolution bandwidth of 2 percent for mobile digital stations in section 27.53(m)(6). In its NPRM, the Commission proposes to modify the out-of-band emission limits as requested by WCAI.<sup>3</sup>

WCAI supports the Commission’s proposal to amend the OOBE limits in the 2.5 GHz band. Aligning outdated OOBE limits with global standards is necessary to realize the full benefits of 4G technologies: maximum spectral efficiency and broadband throughput, global scope and scale, and consumer-driven form factors. Achieving these

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<sup>1</sup>*In the Matter of Wireless Communications Association Int’l Petition to Amend Section 27.53(m) of the Commission’s Rules*, Public Notice, RM-11614 (rel. Nov. 4, 2010).

<sup>2</sup> Petition for Rulemaking, Wireless Communications Association International, Inc., RM-11614 (filed Oct. 22, 2010).

<sup>3</sup> NPRM at ¶¶ 11-13.

benefits is critical to fulfilling the goals of the National Broadband Plan and meeting the needs of U.S. consumers. The alternative – maintaining unique OOB limits in the U.S. – would undermine the nation’s broadband goals and risk leaving U.S. consumers behind the global broadband curve.

The National Broadband Plan set six goals to serve as the nation’s broadband compass over the next decade. The second goal is for the United States to “lead the world in mobile innovation, with the fastest and most extensive wireless networks of any nation.”<sup>4</sup> To lead the world, U.S. mobile networks must meet or exceed the world’s standards. The current OOB limits in the 2.5 GHz band, which limit mobile devices to 10 MHz channels, do not meet the latest 4G standards. The International Telecommunication Union’s (“ITU”) requirements for IMT-Advanced<sup>5</sup> radio systems (i.e., mobile broadband) mandate scalable channel bandwidths up to and including 40 MHz and encourage channel bandwidths up to 100 MHz wide. The 2.5 GHz band is expected to become a leading band for mobile broadband deployments worldwide<sup>6</sup> and will be critical spectrum for realizing the ITU’s recommended channel bandwidths of 40-100 MHz. If the United States wishes to fulfill the second goal of its National Broadband Plan – to lead the world in mobile innovation and throughput – it is imperative that the Commission’s rules accommodate the larger channel bandwidths recommended by global standards in the 2.5 GHz band.

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<sup>4</sup> “Connecting America: The National Broadband Plan,” Federal Communications Commission, Chapter 2 (March 2010) (available at <http://www.broadband.gov/plan/2-goals-for-a-high-performance-america/>).

<sup>5</sup> See Report ITU-R M.2134 (available at <http://www.itu.int/publ/R-REP-M.2134-2008/en>).

<sup>6</sup> See “The 2.6 GHz Spectrum Band, Unique Opportunity to Realize Global Mobile Broadband” (available at [http://www.gsmworld.com/gvp\\_report](http://www.gsmworld.com/gvp_report)).

The amendment proposed by WCAI would do just that by aligning the Commission's rules with the approach of the global 3rd Generation Partnership Project<sup>7</sup> (3GPP) and future WiMAX standards applicable to the 2.5 GHz band.<sup>8</sup> Specifications from the IEEE and 3GPP for 802.16m and LTE systems are being designed to meet the ITU's recommendations for wider channel bandwidths. For example, the 3GPP standards define three bands for the 2500-2690 MHz band (bands 7, 38, and 41),<sup>9</sup> all of which support 20 MHz channel bandwidths today based on Release-8 of the specifications. In 3GPP Release-10 (which is in development today), these same bands will support carrier-aggregation features to create channel bandwidths up to 100 MHz wide.

As WCAI noted in its PFR,<sup>10</sup> providing for operation of wider channel bandwidths would promote efficient use of the spectrum and maximize broadband throughput by allowing operators to provide the full uplink capacity available in 20 MHz or wider channels. Aligning the Commission's rules with the applicable 3GPP standard and future WiMAX standards would also enable manufacturers and network operators to realize enormous economies of scope and scale in 2.5 GHz mobile devices, which would otherwise need to be customized for use in the United States, and achieve a reasonable balance between smartphone design issues (e.g., size, battery life, and heat dissipation) and the spectral efficiency of wider channel bandwidths. The resulting throughput gains,

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<sup>7</sup> The 3rd Generation Partnership Project is a consensus-driven international partnership of telecommunications standards bodies.

<sup>8</sup> See 3GPP TS 36.101 V8.7.0 (2009-09).

<sup>9</sup> See 3GPP TS 36.101 V10.2.1 (2011-04), page 17, Table 5.5-1.

<sup>10</sup> See PFR at p. 6.

cost savings, and device innovation would put the U.S. on the right track for leading the world in mobile innovation.

Maintaining stricter OOB limits at the band edges of the 2.5 GHz allocation, however, would derail the nation's mobile broadband goals.<sup>11</sup> Stricter limits at the band edges would lower expected gains in spectral efficiency and broadband throughput. It would also create a unique OOB framework for the United States and prevent manufacturers and network operators from realizing the enormous economies of scope and scale in the emerging global ecosystem of 2.5 GHz mobile devices. Stricter OOB limits at the band edge would require mobile devices to implement transmitter filtering and/or reduce transmission power for channels near the band edges as compared to interior channels. Dynamically managing transmissions on channels near the band edges would require additional, channel-specific RF filtering hardware, software intelligence, and radio protocol messaging. Such mobile device radio architectures would be unique for the 2.5 GHz band in the U.S. and would require changes to international standards. The result would be significant complexity, delay and cost burdens for any broadband network operator in the 2.5 GHz band.

Stricter limits at the band edges would be all pain and no gain, because a stricter limit at the band edge is not needed to prevent harmful interference. As WCAI explained in its PFR, the likelihood of heightened adjacent band interference is remote and processes are already in place to mitigate any adjacent band interference issues that might arise.<sup>12</sup> The proposed rule change for mobile digital stations targets the emerging

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<sup>11</sup> NPRM at ¶ 16.

<sup>12</sup> PFR at pp. 7-8.

generation of highly mobile 4G devices (e.g. smartphones). The real-world behavior of these devices in the context of 4G system design demonstrates that increased interference is highly improbable.

First, the practical output power limitations of industry transmitter designs for 4G mobile devices mitigate the potential for harmful interference. The maximum EIRP for mobile devices in the EBS/BRS band is 2 watts (33 dBm). However, based on battery life and thermal design constraints, mobile broadband devices such as laptop cards and smartphones are typically designed to operate at a maximum of only 200 milliwatts (23 dBm). The form factor limitations on such devices also dictate extremely low performance antennas, typically constrained to zero dBi (or even negative) gain. Accordingly, the preponderance of current and emerging 4G mobile broadband devices will be operating 10 dB lower than the output power rules permit and would pose no risk of harmful interference.

The types of devices that would operate at or near the 2 watt output power limit are also unlikely to cause interference due to their intended use and form factor. For example, due to their larger form factor and power sources, “portable” or “nomadic” stand-alone modems connected to desktop or laptop computers typically operate at higher power than fully mobile smartphone-type devices. But, because nomadic devices do not move as frequently as smartphones (if at all) and are typically confined to residences, nomadic devices are much less likely to be in close physical proximity to other fixed or mobile receivers operating on adjacent channels. Nomadic devices would thus not cause harmful interference under the OOB limits proposed in the FNPRM.

Second, mobile 4G devices using orthogonal frequency-division multiple access (OFDMA) technology will typically not be allocated all available uplink bandwidth while at the same time operating at full transmit power. The OFDMA multiple access scheme shares the uplink channel among multiple users in the manner of both frequency division multiplexing (FDM) and time-division multiplexing (TDM). Therefore the transmission bandwidth allocated for each mobile device is much narrower than the full channel bandwidth, and occurs for a duration that is a fraction of the total frame duty cycle of the communication protocol. To preserve battery life and minimize intra-system interference (particularly in reuse one based 4G cellular systems), mobile devices operate under very stringent power control rules, which are explicitly designed to minimize transmission power at all times. Typically mobile devices only operate at full power when they are in cell edge regions of the coverage area. In these situations the composite energy of the device is typically also confined to the narrowest bandwidth possible in order to maximize the range of the system while preserving battery life. This limits the instantaneous bandwidth that is typically used at full power, and hence the out of band emissions.

As a result, the spectral emissions mask (SEM) being proposed is not the same as the instantaneous emissions expected from any one device. Instead the SEM is the composite mask of all different forms of instantaneous emissions that may occur, the actual emissions being a function of the power allocated and the number and location of the allocated frequency resources to any one user of the OFDMA based system. This is why the adjacent channel leakage ratio (ACLR) of 4G systems based on OFDMA is

typically much less than represented by the SEM.<sup>13</sup> Therefore, for 4G systems, a relaxation of the SEM cannot be inferred as resulting in an equivalent increase in the potential risk of interference because 4G systems are designed to avoid the combination of factors that would most likely lead to greater risk.

In sum, the probability that a next-generation EBS/BRS mobile station would operate at full transmit power across an entire channel all of the time in areas without any path loss to unsynchronized adjacent legacy receivers is typically very low. Given the very small risk of any additional interference as a result of the OOB limits proposal in the FNPRM – let alone harmful interference – and the clear benefits of the proposal to mobile broadband, WCAI urges the Commission to implement the changes to the OOB limits as proposed by WCAI and without any additional limits at the 2.5 GHz band edges.

## **II. Conclusion**

WCAI supports adoption of the modifications to the 2.5 GHz OOB rules proposed in the NPRM. Amending the 2.5 GHz band OOB limits as requested by WCAI is necessary to meet the goals of the National Broadband Plan and facilitate the rapid deployment of 4G mobile broadband services in the 2.5 GHz band nationwide without harmful interference.

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<sup>13</sup> ACLR is a measure of the amount of power actually transmitted outside of the channel and is a baseline transmitter performance metric included in standardized mobile device specifications.

Respectfully submitted,

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